Sept. 5, 1967 L. S. TAYLOR ET AL 3,339,413

LIQUID LEVEL GAUGE AND PROCESS OF MAKING SAME

Filed March 11, 1965 2 Sheets-Sheet 1

Fig. 1.

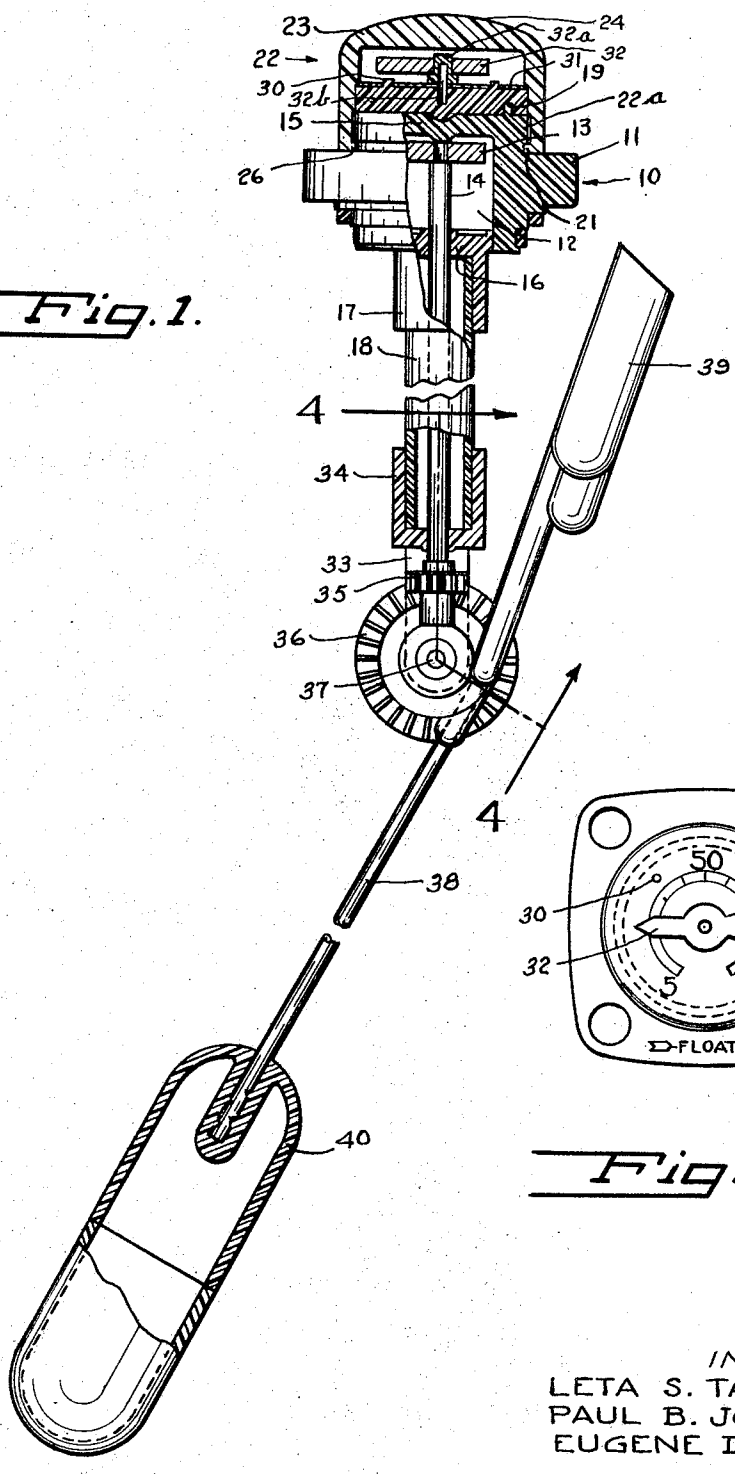


Fig. 2.

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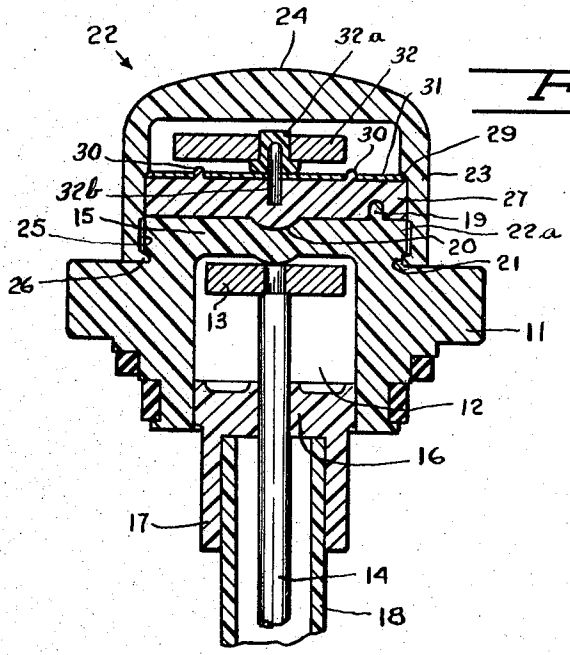


Fig. 3.

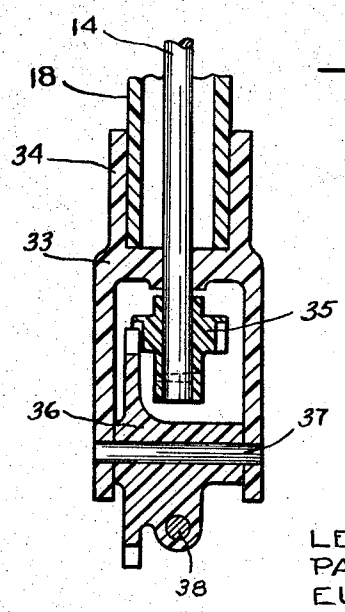


Fig. 4.

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LIQUID LEVEL GAUGE AND PROCESS OF MAKING SAME

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Filed Mar. 11, 1965, Ser. No. 439,023
6 Claims. (Cl. 73—317)

This invention relates to liquid level gages and has particular reference to a new and improved gage and process of making same, which gage is of the type adapted for use with storage tanks containing fluids or liquified gases stored under pressure such as butane and propane and which gage is of the leakproof, magnetic type.

An object of the invention is to provide a new and improved liquid level gage of the type set forth which is simpler and more economical in construction, yet efficient in operation.

Another object is to provide a new and improved gage of the type set forth which allows its use in a greater range of fluids without damage to the gage components than prior type gages.

Another object is to provide a gage of the type set forth wherein the visibility of the dial is improved thus facilitating the reading or viewing of the indication of the tank contents on the dial face.

Another object is to provide a gage having self contained indicating mechanism which may be adapted for removability and sealed to prevent entrance or accumulation of moisture or material foreign to the tank contents.

Another object is to provide a gage of the type set forth having an indicating head which allows the use of dials and dial plates which facilitate the reading of the indication on the dial.

Another object is to provide a new and improved indicator head for liquid level gages or the like.

Another object is to provide a new and improved gage wherein the indicator head is adapted for easy and quick connection to the gage head and yet is securely retained in operative position thereon.

Another object is to provide a new and improved gage head for a liquid level gage, which gage head is adapted for attachment to storage tanks and to withstand the internal pressures of gases in such tanks, and which gage head is relatively simple and economical in construction but will also resist oxidation while exposed to weather conditions.

Another object is to provide a new and improved liquid level gage which is formed of a material which will allow the assembly of components in such manner as by chemical means to thereby allow such components to become effectively integral.

Another object is to provide a liquid level gage wherein the parts normally subject to wear are made of a material which is wear resistant.

Another object is to provide a unitary float, counterweight and drive gear construction for liquid level gages.

Another object is to provide a new and improved process of making a liquid level gage of the type set forth which results in a relatively simple and economical, yet efficient, gage.

Another object is to provide a new and improved process of making an indicator head for a liquid level gage and for attaching said indicator head to the gage head.

Another object is to provide a new and improved process of making a unitary float, counterweight and drive gear unit for a liquid level gage.

Another object is to provide a new and improved process of assembling the components of a liquid level gage to obtain an effectively unitary construction.

Another object is to provide a new and improved liquid level gage and process of making same, wherein all of the components may be made of relatively inexpensive material which is capable of manufacture by molding or casting and which may be chemically united to form an effectively integral construction.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings wherein a preferred form of the invention is shown by way of illustration only.

Referring to the drawings:

FIG. 1 is a side view, partially in section, of a liquid level gage constructed according to the invention;

FIG. 2 is a top or plan view of the gage head and indicator head of the gage shown in FIG. 1;

FIG. 3 is a fragmentary, sectional view, on a larger scale, of the gage shown in FIGS. 1 and 2; and

FIG. 4 is a sectional view taken on line 4—4 of FIG. 1 looking in the direction of the arrows.

Referring more particularly to the drawings wherein similar reference characters designate corresponding parts throughout the several views, the device shown formed according to the invention comprises a gage head designated generally at **10**, having the rim **11** through which are provided openings for bolts or other suitable fastening means for securing the gage head **10** in operative position over an opening in the storage tank. Gage head **10** may be cast or molded of suitable plastic material as hereinafter set forth or die cast of aluminum or zinc depending upon the use intended.

Gage head **10** is provided with chamber **12** for drive magnet **13** which is rigidly secured on the upper end of rotatably mounted shaft **14**, whereby pivotal movement or rotation of shaft **14** effects simultaneous rotation or pivotal movement of drive magnet **13**.

The upper end of gage head **10** is closed or sealed by wall **15** which is formed integral with gage head **10**.

The lower side of chamber **12** is closed by the wall of connector **16** which is formed with integral tubular connector portion **17** depending therefrom to which is secured the upper end of tubular riser **18** which is in telescoping relation with connector portion **17** and secured thereto by bonding or staking.

Connector **16** with tubular portion **17** is molded or cast of chemical resistant plastic.

The locating lug **19** is provided on the upper surface of wall **15** which is also provided with a central recess **20** and peripheral groove **21** which is formed beneath peripheral flange **22***a*.

The indicator head designated generally at **22** comprises cup-shaped gage head crystal **23** which is molded or cast of clear, colorless, transparent plastic or other material such as glass, and may include a portion having curved surface contours **24** of such curvature as to provide desired magnification in such portion **24** to facilitate the reading or viewing of the indications on the dial.

Gage head crystal **23** is provided with the peripheral groove **25** adapted to fit over peripheral flange **22***a* and may be secured thereto by suitable adhesive with rim or lug **26** positioned in peripheral groove **21** whereby the entrance of moisture or dust or the like into indicator head **22** is prevented.

Within indicator head **22** is provided dial support plate **27** which has rcesses in its lower surface for receiving locating lugs **19** to properly orient indicator head **22** on gage head **10** and said dial support plate **27** also may have a central offset portion adapted to be positioned in recess **20** in the upper surface of wall **15**.

Dial support plate **27** is preferably made by molding or casting of suitable plastic or other material and secured in

desired position in indicator read **22** against flange **29** by suitable bonding material or adhesive.

To locate the indicator head in desired or predetermined position on the gage head there are provided on the upper surface of dial support plate **27**, the locating lugs **30** adapted to be positioned in corresponding openings in dial face **31** which may be formed of suitable metal such as aluminum or of other desired material such as molded or cast plastic and this dial face is provided with suitable indicia thereon whereby magnetic pointer **32** indicates on such dial face **31** the contents of the storage tank. Pointer **32** is carried by pointer hub **32***a* which in turn is mounted for pivotal movement on pivot **32***b* which is carried by dial support plate **27**.

The gage head **10** is formed by casting or molding of suitable plastic material or die cast of aluminum, zinc or other material depending upon the use to be made of the gage.

Indicator head **22**, including crystal **23**, dial support plate **27**, dial face **31**, pointer **32**, pointer pin **32***b* and hub **32***a* are assembled to form a single self-contained and sealed indicator head which is pressed on to the gage head and secured thereto by engagement of the rim or lug on the indicator head into the retaining groove in the gage head.

The cast or molded plastic fork **33** has the tubular portion **34** adapted to receive the end of riser **18** and be secured thereto by staking or bonding by suitable chemical dependent upon the plastic material of which the fork **33** and riser **18** are constructed.

Shaft **14** has its end portion extending through an opening in the wall of fork **33** and on the end of said shaft **14** is positioned driven gear **35** which is formed of cast or molded plastic and either pinned to the drive shaft **14** or formed thereon in the case of a metal drive shaft or formed integral therewith in the case of a plastic drive shaft. The driven gear **35** is preferably formed of wear resistant material such as nylon.

The drive gear **36** is pivotally mounted on pivot **37** in fork **33**. This drive gear **36** is preferably formed of wear resistant material such as nylon and meshes with driven gear **35** to thereby pivot drive shaft **14**. Float rod **38** and counterweight **39** may be a metal rod cast or molded to gear **36** which rod can be plastic coated to render them more resistant to chemical reaction, or they can be of plastic and cast or molded integral with drive gear **36**.

Float **40** is of chemical resistant plastic and can be secured to float rod **38** where such rod is of metal and can be cast or molded thereon or molded integral therewith when said rod **38** is made of plastic.

Counterweight **39** can be made of desired weight by controlling the size or material of which it is constructed or it can be formed of plastic coated metal. It is preferable that the unitary drive gear, counterweight, float arm and float be molded or cast as stated above to simplify and reduce the cost of manufacture thereof.

In the manufacture of the liquid level gage of this invention, the gage head **10** may be formed of die cast metal such as aluminum or zinc or molded or cast of a plastic having sufficient strength such as nylon or an acrylonitrile-butadiene-styrene composition which is relatively stable, tough, hard and rigid and withstands acids and pressure and resists weather.

Other plastics which might be employed depending upon the material with which the gage is to be used are polycarbonates, polystyrenes, acrylics, vinyls or others with suitable properties.

Other parts, such as the indicator head, connector riser, fork, drive rod, and drive gears may also be formed of such plastic materials.

Drive magnet and the end of shaft **14** are then placed in chamber **12** in gage head **10** with shaft **14** extending through the opening in the wall of connector **16** to which connector **16** and the end of riser **18** is secured as stated above.

Connector **16** is connected to gage head **10** by bonding or by suitable adhesive.

Fork **33** is then secured on the end of riser **18** by staking or by bonding or by suitable adhesive to connect tubular portion **34** of fork **33** to the end of riser **18**, with shaft **14** extending therethrough.

The unit consisting of drive gear **36**, float rod **38**, float **40** and counterweight **39** is then mounted on fork **33** by pivot pin **37** with gears **35** and **36** in meshing relation.

Where gear **35** is formed integral with shaft **14** it will be necessary to mount fork **33**, riser **18** and connector **16** together as a unit before mounting drive magnet **13** on shaft **14** and then connecting this assembly to gage head **10** as previously described.

The indicator head, which is formed as a unit, as described above is mounted on the upper side of gage head **10** to complete the assembly.

As shown in the drawings, a suitable gasket is provided between the gage head **10** and the storage tank to seal this connection.

From the foregoing it will be seen that we have provided new and improved means and process for obtaining all of the objects and advantages of the invention.

We claim:

1. In a liquid level gage, a gage head formed of cast, non-magnetic material, said gage head being adapted to be positioned over an opening in a storage tank for indicating the quantity of material in said storage tank, said gage head having a peripheral portion whereby said gage head may be operatively connected in operative position to said storage tank, a drive magnet in said gage head, a float member carried by said gage head and adapted to be positioned in said storage tank, means operatively connecting said float member to said drive magnet for actuating said drive magnet according to the quantity of contents in said storage tank, and an indicator head positioned over said gage head, said indicator head including a cup-shaped crystal having a rim portion engaging the upper portion of said gage head and connected thereto to connect said crystal to said gage head, said crystal having an integral transparent dial viewing portion, a dial member carried by said crystal in alignment with said transparent dial viewing portion, and an indicator mounted for pivotal movement relative to said dial member and adapted to be actuated by said drive magnet said dial member comprising a member of cast, non-magnetic material carried by said indicator head intermediate said dial viewing portion and said rim portion, and cooperative locating means on said gage head and said indicator head for locating said indicator head in predetermined position on said gage head.

2. In a liquid level gage, a gage head formed of cast, non-magnetic material, said gage head being adapted to be positioned over an opening in a storage tank for indicating the quantity of material in said storage tank, said gage head having a peripheral portion whereby said gage head may be operatively connected in operative position to said storage tank, a drive magnet in said gage head, a float member carried by said gage head and adapted to be positioned in said storage tank, means operatively connecting said float member to said drive magnet for actuating said drive magnet according to the quantity of contents in said storage tank, and an indicator head positioned over said gage head, said indicator head including a cup-shaped crystal having a rim portion engaging the upper portion of said gage head and connected thereto to connect said crystal to said gage head, said crystal having an integral transparent dial viewing portion, a dial member carried by said crystal in alignment with said transparent dial viewing portion, and an indicator mounted for pivotal movement relative to said dial member and adapted to be actuated by said drive magnet said dial member

comprising a member of cast, non-magnetic material carried by said indicator head intermediate said dial viewing portion and said rim portion, said gage head and said indicator head being both of cast, non-metallic material.

3. In a liquid level gage, a gage head formed of cast, non-magnetic material, said gage head being adapted to be positioned over an opening in a storage tank for indicating the quantity of material in said storage tank, said gage head having a peripheral portion whereby said gage head may be operatively connected in operative position to said storage tank, a drive magnet in said gage head, a float member carried by said gage head and adapted to be positioned in said storage tank, means operatively connecting said float member to said drive magnet for actuating said drive magnet according to the quantity of contents in said storage tank, and an indicator head positioned over said gage head, said indicator head including a cup-shaped crystal having a rim portion engaging the upper portion of said gage head and connected thereto to connect said crystal to said gage head, said crystal having an integral transparent dial viewing portion, a dial member carried by said crystal in alignment with said transparent dial viewing portion, and an indicator mounted for pivotal movement relative to said dial member and adapted to be actuated by said drive magnet, said dial member comprising a member of cast, non-metallic material carried by said indicator head intermediate said dial viewing portion and said rim portion.

4. In a liquid level gage, a gage head formed of cast, non-magnetic material, said gage head being adapted to be positioned over an opening in a storage tank for indicating the quantity of material in said storage tank, said gage head having a peripheral portion whereby said gage head may be operatively connected in operative position to said storage tank, a drive magnet in said gage head, a float member carried by said gage head and adapted to be positioned in said storage tank, means operatively connecting said float member to said drive magnet for actuating said drive magnet according to the quantity of contents in said storage tank, and an indicator head positioned over said gage head, said indicator head including a cup-shaped crystal having a rim portion engaging the upper portion of said gage head and connected thereto to connect said crystal to said gage head, said crystal having an integral transparent dial viewing portion, a dial member carried by said crystal in alignment with said transparent dial viewing portion, and an indicator mounted for pivotal movement relative to said dial member and adapted to be actuated by said drive magnet, said dial member comprising a member of cast, non-metallic material carried by said indicator head intermediate said dial viewing portion and said rim portion, and a non-metallc rod connecting said float and said drive magnet.

5. In a liquid level gage, a gage head formed of cast, non-magnetic material, said gage head being adapted to be positioned over an opening in a storage tank for indicating the quantity of material in said storage tank, said gage head having a peripheral portion whereby said gage head may be operatively connected in operative position to said storage tank, a drive magnet in said gage head, a float member carried by said gage head and adapted to be positioned in said storage tank, means operatively connecting said float member to said drive magnet for actuating said drive magnet according to the quantity of contents in said storage tank, and an indicator head positioned over said gage head, said indicator head including

a cup-shaped crystal having a rim portion engaging the upper portion of said gage head and connected thereto to connect said crystal to said gage head, said crystal having an integral transparent dial viewing portion, a dial member carried by said crystal in alignment with said transparent dial viewing portion, and an indicator mounted for pivotal movement relative to said dial member and adapted to be actuated by said drive magnet said dial member comprising a member of cast, non-magnetic material carried by said indicator head intermediate said dial viewing portion and said rim portion, said dial viewing portion having surface curvatures such as to magnify the image of said dial and indicator seen therethrough.

6. In a liquid level gage, a gage head formed of cast, non-magnetic material, said gage head being adapted to be positioned over an opening in a storage tank for indicating the quantity of material in said storage tank, said gage head having a peripheral portion whereby said gage head may be operatively connected in operative position to said storage tank, a drive magnet in said gage head, a float member carried by said gage head and adapted to be positioned in said storage tank, means operatively connecting said float member to said drive magnet for actuating said drive magnet according to the quantity of contents in said storage tank, and an indicator head positioned over said gage head, said indicator head including a cup-shaped crystal having a rim portion engaging the upper portion of said gage head and connected thereto to connect said crystal to said gage head, said crystal having an integral transparent dial viewing portion, a dial member carried by said crystal in alignment with said transparent dial viewing portion, and an indicator mounted for pivotal movement relative to said dial member and adapted to be actuated by said drive magnet, said dial member comprising a member of cast, non-metallic material carried by said indicator head intermediate said dial viewing portion and said rim portion, said float member comprsing a non-metallic float and non-metallic float drive gear operatively connected together and a non-metallic driven gear on said rod meshing with said float drive gear, a cast, non-metallic connector connected to said gage head, a cast, non-metallic fork supporting said drive gear and a non-metallic tubular riser connecting said connector and work.

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